Report on Forest Restoration in Missouri

A FOREST RESEARCH PROGRAM

Willis M. Baker, Director
Central States Forest Experiment Station
Columbus, Ohio.

A comprehensive, long-time plan for forest restoration in Missouri must necessarily include a program of research adequate to yield information that is essential to the successful realization of desired objectives. In the preparation of this report various interested agencies have been invited to contribute. This section dealing with a forest research program has been assigned to the Central States Forest Experiment Station, which represents the Research Division of the U. S. Forest Service in the central hardwood region.

The Necessity For Forest Research

Preceding sections of the report have stressed the importance of conserving and developing Missouri forests and the resources of timber, water, soil, and wild life which forests produce or protect. The necessity for increased local and State effort as a part of the nation-wide conservation program to restore and perpetuate these essentials of basic wealth has been duly emphasized. It is equally important to recognize the dependence of such a program upon research. As is the case in every great enterprise, whether it be undertaken by private capital in industry or by conservation agencies for the public good, research must keep pace with practice and administration for successful accomplishment. Otherwise, lack of knowledge is certain to impede progress; costly mistakes and delays become inevitable. This fact must be kept constantly in mind by those engaged in, or responsible for, the forest restoration program in Missouri.

Forestry is still relatively new in this country. The application of sound practices and proven methods is retarded almost everywhere by lack of basic information. The development of forest resources and the management of forest lands involve a vast number of interrelated technical, economic, and social problems, the solution of which is absolutely dependent upon knowledge which can be obtained only from studies and experience.

When forest research has not been undertaken on an adequate basis well in advance of forest administration, it becomes necessary to depend to some extent upon trial and error methods, with full recognition of the tremendous costs, the numerous mistakes, and the discouraging delays inevitable in such a procedure. However, to proceed entirely on this basis, without immediate provision for a comprehensive program of research, is too short-sighted even to be considered.

Not especially worth reading.
A statement of problems involved.
Research needed in all fields.

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Two major research institutions now concerned are Agl Ex Station of the Univ of Missouri.
Central Stats Ex. Station.
Ctl is recommended that the future program should emphasize especially farm forestry.

The situation in Missouri is especially critical. In the proximity of the prairie region climatic conditions unfavorable to the establishment and growth of trees complicate the silvical problems of the forester, already made difficult by the fact that the characteristic upland oak-pine types represent relatively early and critical stages of forest development. Many years of excessive cutting, repeated burning, continuous grazing, and serious erosion of top-soil have depleted the forest growing stock and have further exhausted the Ozark soils which originally ranked none too high in the scale of potential forest productivity. Added to all this is the fact that, until recently, very little forestry work has been undertaken in Missouri, so that there is little local experience or precedent to guide the foresters, most of whom have received their training and experience in other regions.

Faced with this situation, Missouri cannot afford to jeopardize the success of her forest restoration program by failing to provide adequately and immediately for research.

Some Urgent Problems

An attempt to describe, or even to mention, each of the many major problems requiring investigation would necessitate a complete résumé of all sections of this comprehensive report. Compared with what remains to be learned, relatively little is now known about the management of forests, their establishment, growth, improvement, protection, utilization, and regeneration. Sufficient information is lacking on the influences of forests in the control of erosion and run-off, or in providing a habitat for wild life. The relationships between tree growth and soil and climate are imperfectly understood. The economic aspects of many phases of forest land use in relation to human development and public welfare require more study and clarification. Problems of forest ownership, organization, taxation, and finance are of great importance.

One might continue at length to enumerate these major or extensive problems, each of which is made up of a multitude of more intensive or minor problems which require investigation, and so on indefinitely. For example, forest planting is undertaken for many different purposes under a wide variety of conditions. A large number of tree species may be used. One of the first steps in any planting project is the production of nursery stock, and one of the many nursery problems encountered is the selection of tree seed. To assure the best results seed studies are necessary, involving their origin, production, collection, treatment, and storage, and each one of these problems may require a number of interrelated investigations. To continue this breakdown for all major forestry projects mentioned in this report would serve no purpose other than to emphasize the vast scope of a comprehensive forest research program. It may be desirable, however, to describe briefly a few of the more urgent problems that demand immediate attention.

Forest Management. Plans of organization are now being devised by State and Federal agencies to provide the best possible management of Missouri's extensive forested areas, now in such a deplorable condition through years of abuse and neglect. To carry out these plans successfully, the agencies concerned must know the methods of management which will restore and maintain forest productivity. In the Ozarks the problem of fire control requires immediate attention to determine the extent of damage caused by the general practice of annual burning. Does the amount of damage exceed any possible benefits of burning, and if so, what methods of fire prevention and control should be employed? The fire problem is closely associated with that of livestock grazing, and again the questions arise: - what are the actual benefits and financial returns of woodland grazing compared with the damages and disadvantages? Can timber and livestock production be carried on together satisfactorily, and if so, how? The problems of burning and grazing involve not only economic questions of land use and community development, but also those of silvics in timber production. Because of past practices, what is the present condition of the forests as to composition of species, thrift and vigor, rate of growth, value for certain products, and the amount, kind, and quality of their reproduction? How can any or all of these conditions be improved, if necessary? What methods of harvesting and utilization are necessary to provide maximum returns, and at the same time to guarantee satisfactory regeneration for sustained production?

Forestation. Measures of proper land use require the restoration of a forest cover on abandoned, eroding, or depleted areas in all parts of Missouri, and public agencies are now sponsoring a greatly increased program of forestation on public and private lands. To assure the success of this undertaking it is first necessary to know the best tree species to plant for any given set of conditions. They must be suited to their intended use for certain products or for protective forest cover; adapted to the soils of the planting site and to local conditions of climate; able to resist or survive the attacks of destructive insects, tree diseases, or other enemies likely to be encountered. It is also necessary to determine for each species what size, age, and condition of nursery stock is best able to withstand the hazards of field planting to give the most satisfactory establishment and survival on various soils and sites, and how such stock can be produced most efficiently and at the least cost in the nursery. Moreover, good nursery stock of desirable species must be handled, transported, and planted properly. Attention must be given to preparation of site, planting methods and equipment, spacing, mixture of species, subsequent protection, release from competing growth, and other measures of plantation establishment and management. Lack of essential information in any one of these many steps of a forestation project may result in complete failure.

Forest Influences. The management of natural forest stands and the establishment of forests by planting may be undertaken primarily for the yield of products, for a protective cover to safeguard other resources, or for a combination of these purposes under carefully regulated multiple use such as is contemplated under the Missouri conservation plan. Accordingly it becomes necessary to learn more about the beneficial influences of forests, and how they may be maintained under different systems of management

to meet various conditions. Recent disastrous floods and droughts emphasize the need for more information on the efficacy of forest cover in retarding the rapid run-off of rainfall and melting snow, in helping to maintain and regulate streamflow, and in conserving underground water supplies. The influence of trees in the control of soil erosion by water and winds needs more investigation, as well as the benefits of shelterbelts and windbreaks to protect crops, livestock, farm homes, and communities. Success in restoring many kinds of game animals, birds, and other forms of wild life is dependent upon knowledge of management methods that adequately protect their shelter and food supply. The possibilities of more recreational use of Missouri's extensive forests and waters by the public also require immediate investigation.

Economics. The importance of further economic studies must not be overlooked, for the data they yield are often fundamental to the formulation of policies and to the establishment of organizations to carry them out. More information is needed on the relation of forestry projects to industry and to agriculture; on forest finance and taxation; on the problems of manufacturing, utilizing, and marketing forest products. We should have a better knowledge of conditions favorable to the expansion of private and farm forestry practices, as well as an unprejudiced evaluation of the obstacles which may tend to obstruct the application of sustained yield methods, either generally or locally. An inventory of the forest resources of Missouri, similar to the forest surveys conducted by the U. S. Forest Service in other parts of the country, would prove most helpful to the agencies now organizing the forest restoration program.

Administrative Contributions to Research

All of the many problems referred to in this report, and others of importance which might have been mentioned, are closely interrelated. Therefore, it is self-evident that efforts toward their solution must be effectively coordinated if waste of time and money and duplication of effort are to be avoided. The cooperation of all interested agencies and individuals is essential. Yet it is not easy to direct attention to the intensive, technical problems of research at a time when most public agencies engaged in Missouri forestry are necessarily giving chief consideration to problems of organization and primary development.

The forest restoration program may be compared to an industry, in which the manufacturer builds and equips a factory so that certain products may be produced efficiently and sold profitably. Before he starts building he knows what he will manufacture and what methods of production he will use. The factory itself is not the main objective, but merely a means to an end. So we may conceive the efforts of public agencies engaged in acquiring, organizing, and developing Missouri forest lands: they are building and equipping the forest factory which will turn out its goods in the form of wood products, wild life, recreation, and beneficial forest influences. Unlike the manufacturer, however, conservationists have not yet learned all they need to know in order to get the results they want and expect. Now is the time to start obtaining this necessary information, and not after production is ready to start.

It cannot be too strongly emphasized that, until forestry and conservation projects are founded upon knowledge of facts resulting from fundamental research in basic sciences, many mistakes, delays, and even failures must be expected. On the other hand, projects already started cannot be postponed indefinitely awaiting the ultimate explanations of extremely intricate biological phenomena which eventually must be supplied through exact and time-consuming research. Certain activities must be carried on as well as possible under the existing circumstances with the information now available, and those in charge must often depend upon intuition and guesses in lieu of knowledge which should have been obtained before the work was started.

Faced with this difficult situation, every administrative agency and every individual engaged in forestry or associated projects should be alert to contribute as much information as possible to the deficient store of knowledge. This may be done through observations and progress records of work attempted. Reports of failure are valuable and may prevent others from making similar mistakes. Fact-finding investigations should be conducted at every opportunity. This job of acquiring all the knowledge needed is so large and so important that no possible contribution should be overlooked.

Information secured by what may be termed "non-research" agencies must be disseminated if it is to be used, and not buried in the files. Records and reports should be made available by publication in some form whenever possible, or else turned over to a research organization dealing with the particular problem. The closest possible contacts should be maintained by workers in the fields of administration and research. The investigator should be thoroughly familiar with the practical as well as the technical problems of forest work, so that he may anticipate the limitations often imposed upon his theories by actual conditions of woods operations. The administrator should know of research projects being undertaken and something of the methods of study used. His advice and suggestions are often invaluable.

Organization of Research

The ultimate success of the Missouri plan for forest restoration demands the immediate establishment or expansion of research agencies to carry on necessary experiments and studies. While the investigations, reports, and observations from all possible sources will prove most helpful and are needed to complement the organized research effort, as has been pointed out, they alone cannot be expected to furnish more than a part of the information so urgently required.

Just how forest research should be organized in Missouri must be decided by the State and local authorities concerned. The prerogatives of the writer limit him to a general discussion of research organization which experience elsewhere has shown to be most efficient, and to a statement of present organization as it exists.

An effective research institution must have permanency of organization, finances and resources adequate to meet its objectives, and opportunity

for continuity of effort. It must be relieved from interruptions so frequently imposed by various emergencies in administrative work; to insure this, organization upon a more or less independent basis is advisable. Correlation of research within an institution, and coordination of effort between research agencies, are very necessary to avoid loss of time, waste of funds, and needless duplication. Concentration of research within a few organizations is an aid to coordination, whereas dissipation of effort among many makes this more difficult to achieve.

Various state and federal agencies and certain individuals have contributed the present knowledge pertaining to or associated with Missouri's forest problem, but most of this has been in the related fields of land utilization, rural economics, soil and water resources, park administration, and game management. The extent and sources of this information are indicated in previous sections of this report, so they need not be repeated here.

The two major research institutions now chiefly and directly concerned with technical problems of forestry and forest land management are the Agricultural Experiment Station located at Columbia with the University of Missouri, and the Central States Forest Experiment Station, which represents the Research Division of the U. S. Forest Service in the central hardwood region. Since this section of the report deals primarily with forest research, further discussion and recommendations will be confined to these two institutions.

Much of the available information concerning the scope and economic aspects of Missouri's forest problem in relation to land use is the result of investigations by members of the Agricultural Experiment Station and the University. Courses in forestry are now taught to students in the College of Agriculture and an extension forester has been employed to advise and assist farm woodland owners, but relatively little technical forest research has been attempted as yet. Minor projects now under way include studies of fence post durability, site requirements and growth of native tree species, artificial propagation of trees and shrubs, and the possibilities of Christmas tree crops. These should be continued and extended.

In view of the great need for more information dealing with forestry technic, methods, and results, it would appear logical and highly desirable to increase the program of forest research at the Missouri Agricultural Experiment Station and University, with special emphasis on important problems of farm forestry. This institution has a splendid background for such a program, with its established departments of forestry and horticulture, rural economics, botany, soils, zoology, biology, animal industry, agricultural engineering, and others. Its contacts with rural organizations and problems place it in a most favorable position to promote the practice of forestry on private and farm lands, and to cooperate most effectively with other agencies in the solution of all forest problems. The success of forest restoration in Missouri demands that the most be made of these opportunities.

The Central States Forest Experiment Station was created by act of Congress and established at Columbus, Ohio, in 1927, for the purpose of obtaining essential facts and information necessary to the development of

sound forestry practices in the central hardwood region, which extends from Ohio to Iowa and south through western Tennessee and northern Arkansas. Since most forestry problems are not limited to one locality, but usually are common to a considerable region covering several states where forest, soil, and climatic conditions are similar, the region-wide approach of the Station to the solution of these problems is not only economical, but it also permits of very effective cooperation with many local, state, and federal agencies. This, in turn, provides for a comprehensive appreciation of all phases of a problem, as well as an excellent opportunity to promote coordination of effort in research.

The Forest Experiment Station has initiated studies pertaining to many phases of forestry, including the growth and yield of important tree species; grazing damage to farm woods and their recovery after removal of livestock; regeneration and silvicultural management of upland hardwood forests; causes and extent of timber defect; nursery practice and forest planting; relation of soil and site conditions to tree growth, and the protective influence of forest cover on the porosity and water absorption of soils. The U. S. Bureau of Entomology and Plant Quarantine has maintained an entomologist at the Station for forest insect investigations, with emphasis on locust borer control; a forest pathologist of the Bureau of Plant Industry provides regional service in forest nursery problems. Recently field branches have been developed on Experimental Forests set aside for the use of the Station on National Forest lands in the adjoining states of Arkansas and Illinois.

The territory served by the Station is so large, the agencies requesting help and cooperation are so many, the important problems requiring immediate investigation are so numerous, and the financial resources of the Station have been so limited, that very careful consideration of projects has been necessary to prevent an ineffective dissipation of effort. This situation still exists. Much of the Station's present work* pertains directly to Missouri problems, and, recognizing the importance of the Ozark forest region, it is making every effort to expand its services here as rapidly as additional funds make this possible.

To summarize, the continuation and immediate expansion of forest research are vital to the success of the Missouri forest restoration program. This requires the active cooperation of all interested agencies and individuals, in addition to an organized expansion of the research effort. The two major research agencies now organized to carry on in this field are the Missouri Agricultural Experiment Station and University, and the Central States Forest Experiment Station. Both are equipped to make contributions vital to the success of the forestry program, if their resources are expanded in proportion to the urgent need for more forestry knowledge. Needless duplication and waste of time and effort in research should be prevented by effective cooperation and by coordination of the investigative projects of all agencies.

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*See reports available for distribution upon request.